

MULTIPURPOSE FIRE EXTINGUISHER ROBOT

Project Reference No.: 49S_BE_3247

College : Hirasugar Institute Of Technology, Belagavi
Branch : Department of Mechanical engineering
Guide(s) : Prof.D.N.Inamdar
Student(s) : Mr.Chetan Desai
Mr.Harshal Kabbueri
Mr.Siddharth Piraji
Mr.Sourabh Kokitakar

Keywords:

Fire Fighting Robot, Robotics, IoT (Internet of Things), Fire Detection, Arduino, Automation, Safety System

Introduction:

A multipurpose fire extinguisher and solar plate cleaning project focuses on designing a single, versatile device that can extinguish different types of fires while also helping clean solar panels for better efficiency. It aims to improve safety, save time, and reduce the need for separate tools by providing a portable, easy-to-use, and reliable solution for both fire emergencies and solar panel maintenance.



Figure 1: Multipurpose Fire Extinguisher Robot

Objectives:

1. Fire Detection and Suppression
2. Surveillance and Monitoring
3. Autonomous Navigation
4. Multi-Task Functionality
5. Safety and Efficiency

Methodology:

1. **System Design:** Plan the robot's mechanical structure, including body, mobility, and extinguisher placement. Select appropriate electronic components such as microcontroller, sensors, motors, camera, and power supply. Develop software for fire detection, navigation, communication, and control operations.

2. **Prototype Development:** Build the robot by assembling mechanical parts, connecting sensors and actuators, and integrating the software with the hardware system.
3. **Testing and Calibration:** Evaluate the robot in controlled environments to ensure accurate fire detection, proper sensor calibration, smooth movement, and effective extinguishing performance.
4. **Implementation:** Deploy the robot in real-world scenarios, monitor its performance, and make necessary adjustments to improve efficiency and reliability.
5. **Evaluation and Documentation:** Compare the robot's performance with the project objectives, record observations, document system design and operation, and identify areas for further improvement and future development.

Result and Conclusion:

Result:

The multipurpose fire extinguisher robot was successfully designed, developed, and tested. It effectively detected fire using sensors, navigated through the environment, and extinguished small-scale fires. The system showed reliable coordination between sensing, movement, and extinguishing, though minor limitations in obstacle handling and response time were observed.

Conclusion:

The project achieved its objective of creating an automated fire-fighting robot that enhances safety by reducing human involvement in hazardous situations. While the system performed well, future improvements can focus on better sensor accuracy, advanced navigation, and increased extinguishing efficiency for real-world applications.

References:

1. V. J. Sangewar et al., "Design and Development of Multi-Purpose Fire Extinguisher Robot," International Journal of Science and Research (IJSR), vol. 10, no. 7, pp. 1200–1204, 2021.
2. R. Yashaswini et al., "Fire Fighting Robot Using Wi-Fi Module," International Journal of Progressive Research in Science and Engineering (IJPRSE), vol. 2, no. 6, pp. 45–49, 2021.

Future Scope:

The development of Multipurpose Fire extinguisher robots is still in its early stages, and there is significant potential for innovation and improvement. Here are some key areas where fire-fighting robots could evolve and find more applications in the future:

The future scope of this project includes:

1. **AI & Autonomous Navigation:** Use AI/ML for smart decision-making, obstacle avoidance, and real-time mapping (SLAM).
2. **Advanced Sensors:** Integration of thermal, gas, smoke, and multi-spectral sensors for accurate fire detection.

3. **Improved Mobility:** All-terrain robots, drones for aerial firefighting, and modular designs for different fire types.
4. **Swarm Robotics:** Multiple robots working together for faster and efficient fire control.
5. **Better Communication:** Use of 5G and telepresence for real-time monitoring and control.
6. **Smart Integration:** Connection with smart city systems and automated fire safety infrastructure.
7. **Power Efficiency:** Longer battery life and energy-harvesting technologies.